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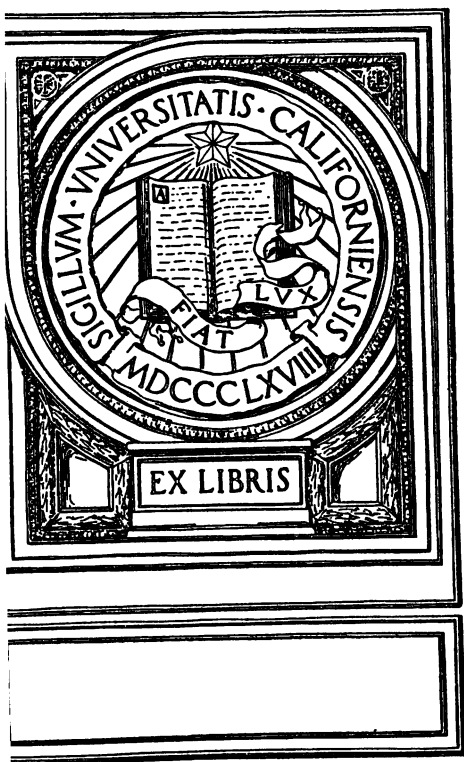
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FACULTY STUDIES—No. 1
A SPECIAL LIBRARY FOR THE
RUBBER INDUSTRY

By JOSEPHINE A. CUSHMAN, Ph. B. (Akron), B. L. S. (Illinois)
Associate Librarian
Municipal University of Akron



PUBLISHED BY
THE MUNICIPAL UNIVERSITY OF AKRON
1920

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A SPECIAL LIBRARY FOR THE
RUBBER INDUSTRY

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PREFACE

This study was suggested by the writer's knowledge of the library conditions existing in the rubber industry in Akron, Ohio, and has been pursued as a part of the course of study of the University of Illinois Library School.

There are, in Akron, some twenty or thirty rubber manufacturing companies, large and small. Of these, the three largest, the B. F. Goodrich Co., The Goodyear Tire and Rubber Co., and the Firestone Tire and Rubber Co., all maintain three library collections within their walls, a technical collection, for the use of the laboratories, a general library for the offices, and a factory library. In these they employ trained or experienced librarians. In spite of the seemingly adequate library facilities enjoyed by these companies, the writer has been told that it is often necessary to send a man to New York or Washington for some important study, usually of a technical or scientific nature, which it is impossible to carry on in the libraries of either Akron or Cleveland.

The public library in the city is small with practically no technical literature, and only a meager business collection. The Municipal University of Akron, with a strong chemistry department offering courses in rubber chemistry, has a good, though small, working collection of general and rubber chemistry, but owing to the demands made upon its collection by its students is able to give but a limited service outside its walls. Both of these libraries gladly do such occasional reference work for the industrial libraries as they are called upon to do, but this is inconsiderable in amount.

The Municipal University has expressed the willingness to give housing facilities to a central technical library to be supported by the joint efforts of the University and the various rubber manufacturing firms. This study has somewhat elaborated the idea suggested, extending the scope of the library to include material on all the interests of the industry, instead of limiting it to the technical interests only. It aims to suggest the types of material available on the various subjects discussed

rather than to make an exhaustive study of the literature published on these subjects. Owing to the peculiar conditions leading to the undertaking, emphasis has been put on the technical rather than on the general collections.

Thanks are due to Miss Marian E. Sparks, Librarian of the Chemistry Library at the University of Illinois, for her aid in the study of chemical literature; to Mr. H. E. Simmons, Professor of Chemistry at the Municipal University of Akron, and to the B. F. Goodrich Co., for help and material in regard to the chemical problems of rubber manufacture; to Dr. Simon Litman, Assistant Professor of Economics in the College of Commerce of the University of Illinois, for suggestions as to the treatment of the commercial problems; and to Miss Florence R. Curtis, Assistant Professor of Library Economy in the University of Illinois Library School, for her suggestions and constant supervision of the work.

JOSEPHINE A. CUSHMAN.

June 18, 1919.

University of Illinois Library School.

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UNIVERSITY OF AKRON

A SPECIAL LIBRARY FOR THE RUBBER INDUSTRY

Introduction

During the past ten or twenty years American manufacturers have become more scientific in their methods. Progress in the utilization and refinement of raw materials has led to a need of technical and scientific knowledge, while the increase in the size and complexity of business organizations has made necessary a close study of business administration. It has required constant experimenting to raise the quality of manufactured goods, reduce the cost of production, and meet the ever increasing competition in the markets of the world.

The rubber industry has obeyed the common impulse. From the very nature of the materials with which it works, it has found scientific research indispensable. Experimental laboratories have become one of the essential departments of the factory organization. Research in the laboratory soon led to a dependence upon technical books and periodicals, while the development of scientific management created a demand for other types of literature. Because of these facts the library has won its way within the factory walls. Whether as a technical collection or as a business library, or both, it has so manifestly filled an urgent need that its future is assured.

It is the purpose of this study to consider how a library may serve the rubber industry, some of the material available for its collection, and the methods by which that material may be prepared for use.

The Technical Collection

The one group of literature most important to the rubber industry is that dealing with chemistry and physics, a knowledge of which is necessary at almost every step of the process of manufacture. The raw gums must be analyzed to show their chemical and physical properties and the result of this analysis determines the

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compounds that must be used with each gum. For instance, the presence of resins and proteins in raw rubber increases the speed of vulcanization and the amount of these substances indicates the proper proportions of accelerators and vulcanizing agents which must be used. The chemical and physical qualities possessed by the raw gums bear a direct relation, also, to the quality of cured rubber that can be made from them. By analysis, therefore, the gums are graded and their fitness for certain types of rubber goods are determined. Certain grades are used in goods requiring a high degree of elasticity, such as dental dam and rubber bands, while other grades are used in goods requiring strength and wearing qualities, such as belts and the treads on automobile tires. Finally, the finished product must be tested to determine its suitability for the purpose for which it was designed. Insulated wire, battery jars, and other goods coming in contact with electric currents must be studied for the electrochemical and electrophysical reactions. Goods designed to be used with chemicals, or for surgical, dental, or similar purposes, must be watched for chemical reactions which may be harmful or beneficial. The textiles entering into the manufacture of many rubber articles bring in physical problems of their own, while the making of synthetic rubber and the reclaiming of old rubber are, also, largely chemical processes and the objects of much investigation.

The examples noted above are but a few of the chemical and physical problems arising in the manufacture of rubber. The fact that rubber is a chemical substance and the process of vulcanization as a chemical process is little understood as yet makes experimentation and research work more important in this industry than in many other kinds of manufacture.

Aside from the problems occurring in the manufacture of rubber there are many points in the cultivation and preliminary treatment of the gum which it is the province of the manufacturer to know, since they affect the quality of the raw material which he must use. These embrace the chemical and physical qualities of the latex produced from different plants and the effect resulting from the different methods of cultivation and preparation. They do not concern the manufacturer so much as the

problems within his own domain but he should understand enough of them to know what producers furnish the gums best suited to his needs, to know the methods by which any particular excellencies in a given product are secured, and to be able, as well, to keep track of the adoption by other producers of those methods. There is a great deal of experimentation carried on by the rubber growers and, since plantation rubber is now upon a firm footing, constant progress in the improvement of raw material may be expected.

The technical literature applicable to the rubber industry is large in amount and scattered throughout almost the whole field of chemical and physical publications. There is but little of it to be found in books, for the very reason that industrial science is a live subject and progress in it so rapid that books are out of date before they are published. There are, however, some volumes which will be found useful. These include works on the production, chemistry and manufacture of rubber¹, as well as a few on chemistry itself², particularly in its physical, organic and colloidal phases.

There are some trade journals devoted to the rubber industry, but they are few and inferior in value to the scientific journals. Probably the best is one in German, the *Gummi Zeitung*, but there are several in English and one in French³. Aside from these, several journals devoted to the various chemical and allied trades will prove useful⁴.

By far the most important group of material for

1. Suggested books on rubber: Caspari, W. A. *India Rubber Laboratory Practice*. London, 1914; Dittmar, Rudolf, *Die Technologie des Kautschuks*, Leipzig, 1915; Gottlob, Kurt. *Technologie der Kautschukwaren*. Braunschweig, 1915; Porritt, B. D. *Chemistry of Rubber*. London, 1913; Seeligmann, Thomas. *India Rubber and Guttapercha*. London, 1903; Wickham, H. A. *On the Plantation; Cultivation and Curing of Para India Rubber*, London, 1908.

2. Suggested books on chemistry: General: Martin, Geoffrey. *Industrial and Manufacturing Chemistry*. Pt. 1. Organic, Pt. 2. Inorganic, 1915-17; Colloid chemistry: Ostwald, Wolfgang. *Handbook of Colloid Chemistry*, tr. by M. H. Fischer. 1915; Taylor, W. W. *Chemistry of Colloids*. 1915; Zsigmondy, Richard and Spear, E. B. *Chemistry of Colloids*. 1917.

3. Rubber trade journals: *Gummi Zeitung*; *Gummi Markt*; *Le Caoutchouc et Guttapercha*; *India Rubber Journal*, London; *Rubber Age and Tire News*, N. Y.; *India Rubber World*, N. Y.; *India Rubber Review*, Akron, O.

4. Other journals useful to the rubber industry: *Color Trade Journal*; *Chemical Trade Journal* and *Chemical Engineering*; *Drug and Chemical Market*; *Automotive Industry*; *Horseless Age*; *Automobile*; *Electrical World*; *Electrical Review*; *Fibre and Fabric*; *Textile American*; *Textile World*; *American Gas Engineering Journal*; *Gas Age*.

the rubber chemist is to be found in the scientific journals and the publications of the scientific societies. The number of titles in this group runs very high, there being over two hundred periodicals covering various fields of chemistry which one might expect to find useful to the rubber chemist. They include many in foreign languages. Most of these are in German but there are a great number, also, in French, Italian, Dutch and the Scandinavian languages. It is possible that the trend of affairs following the recent war will build up such a body of chemical literature in English as to make the foreign journals of relatively less importance than hitherto. Until that condition occurs, however, a considerable number of foreign ones will be indispensable⁵.

Since the best key to this mass of literature is to be found in the abstract journals, it should be the first concern of the library to buy all of these which can be of service. Abstract journals serve two great ends. They save the investigator the necessity of reading a mass of material irrelevant to his needs and often in a brief summary of an article furnish all the information necessary. They, also, refer the librarian to material in his own collection that is needed and suggest to him further purchases to make. The most important abstract journal is the Chemical Abstracts, but there are many others which are devoted in whole or in part to abstracts covering general or specific fields and several of these should eventually be obtained as supplementary aids⁶.

In building up a collection of scientific journals such as would be needed in the library under discussion the general policy should be to buy the most useful first. Subscriptions should be made to all the journals that, from previous experience, were known to be useful or, after careful investigation, promised to be so. The next step would be to build back in the most important sets for the period of the activity of the rubber industry, not hesitating to buy parts of sets where this could be done to

5. See Appendix I.

6. Abstract journals useful to the rubber industry: Chemical Abstracts; Chemisches Zentralblatt; Journal of the Chemical Society, London; Jahresbericht über die Fortschritte der Chemie, (Liebig and Kopp); Jahresbericht über die Leistungen der Chemischen Technologie, (Wagner).

advantage. For instance, the editorial policy of a journal may have been such that in a certain series of years it has given space to subjects of interest to the rubber chemist, and then has changed to another line of investigation. If such a fact could be ascertained from abstracts or otherwise, the volumes valuable to the library could be bought and the others disregarded, thus saving money and shelf room.

Aside from the classes of material named there is a smaller group of national and state documents which would be useful. Among the United States publications the most fruitful for the chemist are the publications of the Bureau of Standards⁷, which makes certain physical and chemical tests upon materials bought for the government, and for private concerns and individuals when so requested. Other departments issue occasional articles of interest to the rubber manufacturer. For example, one of the bulletins of the Labor Statistics Bureau⁸ deals with industrial poisons in the rubber industry, while one of the Public Health Service⁹ describes an investigation into the composition of the gum used in nursing nipples. These publications can be obtained free or at small cost, and by checking the Monthly Catalog of Government Documents it is possible to select useful titles without burdening the shelves with irrelevant material.

There are some periodicals¹⁰ and many government documents¹¹ available on the subject of rubber production on the plantation. Almost every rubber producing country is now establishing experiment stations for the study of the problems of the cultivation of the tree and the treatment of the latex. British India, Ceylon and Dutch East Indies rank first in their efforts along this line. The Kuala Lumpur Agricultural Experiment Station of the Federated Malay States is doing the most notable work in the investigation of the method of treating the latex and its bulletin is, therefore, of great value

7. The Bureau of Standards issues several series of publications, namely, Circulars, Bulletins, Scientific Papers, Technologic Papers.

8. U. S. Labor bureau, Bulletin 179 (Industrial Accidents & Hygiene series.)

9. U. S. Public Health Service. Hygienic Laboratory Bulletin No. 5.

10. Journals treating of the cultivation of rubber: *Der Pflanzer*; *Planters' Chronicle*; *Der Tropenpflanzer*; *Tropical Agriculture* (Ceylon).

11. See Appendix II.

to the manufacturer. The British government through its Board of Scientific Advice for India¹² and its Imperial Institute¹³ lends assistance to the British experiment stations in their agricultural and industrial researches. For this reason the publication of these two bodies are also valuable reference material. The U. S. Experiment Station Record abstracts a large number of foreign as well as national agricultural journals and government publications including a great many articles on rubber. These abstracts cover many analyses of the latex and occasional articles of interest to rubber chemistry and manufacture. By subscribing to the Federated Malay States Bulletin and the Experiment Station Record the library can have available the best of this material for immediate use and be able to locate and determine the value of the more scattered articles from other stations which can then be obtained if deemed of sufficient importance.

Aside from those of chemistry and physics another class of problems which confronts the rubber manufacturer is that of mechanical engineering. There necessarily occurs in any manufacturing establishment which uses machinery the need of keeping that machinery in order. Then, too, the necessity often arises for designing machinery to produce a new article or to meet new specifications or to produce at lower cost than is done by that in present use. To be of aid in this work the library should include material on mechanical engineering. For this purpose there should be some of the better technical and trade journals on this subject¹⁴. Trade catalogs and

12. The Board of Scientific Advice for India co-ordinates the scientific research work of the Indian government, distributes the results thereof, and advises the government in prosecuting practical research into questions of agriculture, economics or applied science. It publishes an annual report on the work done and the general program for the ensuing year. This report and program are submitted to the Royal Society.

13. The Imperial Institute was established to promote inter-imperial trade in raw materials. There are advisory technical committees one of which is on rubber. The institute furnishes scientific and technical advice on matters concerned with agriculture, trade and industry. Its annual report comes out in the British Colonial Reports. It, also, publishes a quarterly bulletin and has issued one volume of Reports and Scientific Papers, 1903. A series of these is now being published in the Miscellaneous series of the Colonial Reports. Part 4 of this series is on rubber.

14. Engineering journals: American Machinist; Engineering News-Record; American Society of Mechanical Engineers. Transactions; Iron Age; Foundry.

patent lists will also be required. Trade catalogs may be used to keep in touch with machines already on the market and to suggest designs for those which must be created, while patent lists serve much the same ends. The latter are sometimes found in technical periodicals, as the Journal of the Society of Chemical Industry, as well as in the Patent Office Gazette of the U. S. government and similar publications of other countries.

Business Management Collection

In common with all manufacturing this industry faces a large group of problems which may be loosely classified under the head of business management. Here occur factory administration, efficiency methods, business finance, credits and collections, accounting, labor and many others. There are a great many books on these subjects, not all of the highest character¹⁵. The library must therefore choose from a considerable amount of literature the particular works which can be helpful to its clientele. In general the few periodicals¹⁶ covering this field will be found more useful than many books largely because their material is more up to date.

Among the problems listed above, that of labor assumes a leading position. It is ever present and is possessed of many phases, only a few of which will be touched upon here. The manufacturer needs to know the legislation in force which may affect conditions of labor in the United States at large and in each state in which he operates, as well as in any foreign countries in which he is an employer of labor. For this purpose codes of labor legislation and failing these revised statutes of the various legislative units should be on file in his library.

Perhaps one of the most important phases of the labor question which is concerning manufacturers today, especially those with large plants employing a great

15. The following are recommended: Alexander Hamilton Institute, N. Y. Modern Business; a Series of Texts Prepared as a part of the Modern Business Course and Service of the Alexander Hamilton Institute, 1917. This institution and the LaSalle Extension University, Chicago, publish many titles on office management, credits and collections, accounting and business finance, as well as on more distinctly trade problems.

16. Periodicals on business management: Factory: Industrial Engineering; Industrial Management; System.

many workers, is that which is commonly termed welfare work. This includes all measures taken by employers for the comfort and contentment of the employee with the idea of increasing his loyalty and efficiency. These measures comprise the housing projects, whether allotments, dormitories or other forms, restaurants, cafeterias, club-houses, hospitals and the like. A comparison of the methods in this work pursued by any one firm with those used by others cannot but be useful, and for this purpose there are available articles in popular and architectural magazines, reports and descriptive material issued by industrial houses, and house organs of various sorts.

Commercial Collection

The last class of problems which will be considered from the point of view of the library is that of trade relations. This subject is of scarcely less importance today in the light of the broadening opportunities which the close of the war is opening up to American business than are the technical processes of manufacture.¹⁷ New markets lie ready for development all over the world, in South America, in Africa, in Asia and the Near East, as well as in more developed countries. American rubber manufacturers are, today, probably better prepared to avail themselves of these markets than firms in any other country, but this does not mean that they can escape a spirited competition. The war has developed rather than curtailed the demand for rubber manufactures. Great Britain and the Netherlands, between them, practically control the production of plantation rubber. It is only natural that they should turn to its manufacture¹⁸. The American manufacturer cannot afford to

17. That Great Britain appreciates the services which a library may offer to the development of post war trade is evidenced by the movement in England to establish commercial libraries. For an account of this movement see *The Commercial Library*, by Jast, in *Library Association Record* 19:118, 1917, also *Interim Report on Provision of Technical and Commercial Libraries*, by *Library Association Council*, in *Library Association Record* 19:551, 1917.

18. The U. S. Daily Commerce Reports, in 1915, noted two factories in Amsterdam and Haarlem manufacturing rubber driving belts and other mechanical goods which have recently been successful in making ebonite or hard rubber. They utilize Dutch East India raw rubber and export largely to the Dutch colonies, Belgium, Great Britain and Africa. Later numbers of the same publication report that during 1916 four rubber manufacturers' associations were formed in Great Britain, covering tire, rubber shoe, rubber tread and balata belting manufacturers, and that a factory has been built in Bandoeng, Batavia, in the Dutch East Indies, while Miss Lillian Elliott in her book, "Brazil Today and Tomorrow", 1917, notes two or three factories in Brazil.

neglect any means which will enable him to secure his share of the world markets and meet the competition with which he will be brought face to face. The library can be of inestimable value at this point in bringing together the best material available on trade conditions. The collection should contain a few choice titles on the theory of trade, foreign and domestic¹⁹. There will be a place, too, for many works which will set forth the trade customs, demands, economic conditions and financial systems of those countries with which trade is sought or maintained²⁰. Transportation is another topic of vital importance to the exporter which should be represented in the collection. So, too, is the subject of tariff schedules in the various countries, and any international labor regulations which may come out of the peace settlement. This material will be found in books, periodicals on trade and commerce²¹, government trade statistics and commerce reports, bank statements, and the publications of trade associations. Nearly every country publishes some sort of year book or statistical abstract which can be used for general reference and which can be supplemented, as desired, by more detailed financial and trade statistics. The consular reports of the United States and the leading European countries will be found exceedingly useful. Great Britain and Germany publish very excellent consular and trade reports, which should inform the American manufacturer of methods followed by those countries in satisfying the whims of the trade. The publications of the Pan American Union, which is devoted to the purpose of creating sympathetic understanding and satisfactory trade relations between the United States and Latin America, also have a large contribution to make. Such organizations as the Chamber of Com-

19. The following are highly recommended: Hough, B. O. *Practical Exporting; a Handbook for Manufacturers and Merchants*, 1915; *Business Training Corporation*, N. Y. *Course in Foreign Trade*, 1916. The *Alexander Hamilton Institute*, N. Y. and the *LaSalle Extension University*, Chicago, also publish books on trade problems.

20. For example, books like the following on Latin American trade: *Filsinger, E. B. Exporting to Latin America*, 1917; *Cooper, C. S. Understanding South America*, 1918; *Babson, R. W. Future of South America*; *Aughinbaugh, W. E. Selling South America*, 1915; *Jones, C. L. Caribbean Interests of the United States*, 1916.

21. *Journals on exporting: American Exporter*, N. Y.; *Export World and Commercial Intelligence*, London.

merce of the United States²², the Guaranty Trust Company²³, and the National City Bank of New York publish material on varying phases of trade and commerce. In addition to the problems of foreign trade are the multitudinous ones of domestic trade. Here come in branch organization, selling methods, advertising and the like. With the exception of advertising, which has developed a specialized literature of its own, these subjects overlap at many points those of foreign trade and business administration. With advertising, as with the latter subject, the most valuable material is found in periodicals²⁴, books being apt to be either too theoretical, too faddy or out of date by the time they appear. The literature in the commercial field is large in amount and varied in character. Much of it can be obtained free or at small cost, and much of it is of temporary value only, being quickly out-dated. This is an advantage to the library as it is not required to house so large a number of volumes.

Administration of the Library

The gathering of books and periodicals is but half of a library's function. So administering its collection that it may be easily and readily available to the man who wishes to use it is of equal if not of greater importance. In fact, a library can often make available to its patrons material which it does not itself possess.

The methods of service employed by any library must be worked out with regard to its own peculiar conditions, and but few general principles can be laid down. Such cataloging and indexing must be done as will help those who use the library, both librarian and patrons, to find the information they want with the least possible expenditure of time and effort. Printed indexes should be utilized wherever possible and such other indexing done within the library as is needed. In the use of these

22. The Chamber of Commerce of the United States publishes "The Nation's Business", monthly. Some of their other publications are, "Bulletin", "Special Bulletin", "Bulletin of Immigration Committee", "Legislative Publications", "General Publications", "Referendums".

23. The Guaranty Trust Company, N. Y., publishes "The Guaranty News" and many separate pamphlets on banking and foreign trade.

24. One of the best periodicals for advertising purposes is "Printers' Ink". There are several others that are useful.

indexes the problem of timeliness arises. As it is often impracticable to wait for them to be published, even where they serve every purpose necessary, some means must be found to supply the need for them before they are issued. A method which is practised in a number of industrial libraries²⁵ and which seems to give satisfaction wherever tried is that of compiling periodically, once a month, or once a week, as may seem desirable, an annotated list of articles in the current numbers of periodicals and like material which may be useful. Such a list is usually prepared in conjunction with a card index for the same articles which is kept in the library as a reference file. It may be checked over with the indexes and abstract journals as they arrive and weeded out of entries duplicated therein, leaving a permanent index covering the stray periodical articles which have escaped the general indexes or which have been treated in them from another point of view, and for publications such as foreign government documents which are not elsewhere indexed.

The practice of keeping and indexing clippings and the methods used if such a policy is decided upon must also depend upon practical considerations of time, expense, and administrative policy.

There is one type of reference service which should have a large use in such a library as the one under consideration. That is photograph service. It should be extremely useful during the early years of the building up of the collection. If from the examination of the abstracts or other reference aids it is found that a valuable article exists, which is not on the shelves of the library, it is possible to send to another library owning the material and procure a photograph of the pages needed. Photograph copies can often be obtained where a direct loan of the book cannot be secured owing to the value, or, more often, to the constant use of the material

²⁵ The General Electric Co., N. Y., publishes a semi-monthly "Library Notice" which simply indexes periodical articles. The B. F. Goodrich Co., Akron, O., issues a weekly digest of important periodical articles for the use of its employees. The New Jersey Zinc Co., N. Y., prepares a "Library Bulletin", a weekly annotated list of periodicals and other articles, for the same purpose. The Portland Cement Association library in Chicago, Ill., issues a monthly list of periodical articles, which it distributes to its office force and to its member companies.

in the library owning it. This sort of service is maintained by several of the large libraries of the country, notably the John Crerar Library of Chicago, and the Library of Congress²⁶. Such a service as this might be depended upon to supply occasional articles in series not otherwise valuable when separate issues could not be obtained. This type of interlibrary service could sometimes be supplemented by direct loan where another library could spare the material desired. Here again, John Crerar and the Library of Congress are to be noted as giving this kind of service, though almost any library is willing to loan material which it is not constantly using.

For local rapid service the telephone is invaluable and it is entirely probable that new methods will be found for the use of this instrument. It might sometime be possible to effect a combination of the dictaphone and the telephone.

Aside from the forms of service which aim particularly to get the material to the user, the library should give great help in working out lists of references on desired subjects, thus putting before the investigator all there is available on any subject. In this kind of work it can draw on the resources of other libraries as well as its own.

Organization of the Library

Library service for the rubber industry can be maintained in several different ways. In the development of the movement in the Middle West the present condition is one of private libraries built up and maintained by each firm for itself. In some cases these private libraries are divided into separate collections, such as technical and general, individually housed and administered for different departments.

Another method that can be practised where there is a large natural center for the industry is the banding together of the firms of the district for the maintenance

26. The John Crerar Library uses the Cameragraph, manufactured by the Cameragraph Company, Kansas City, Mo., while the Library of Congress uses the Photostat, manufactured by the Commercial Camera Company, Rochester, N. Y.

of a central library. The Middle Western group of rubber factories, centering in Akron, Ohio, with the twenty or thirty firms there located and the fringe of firms in nearby towns, offers an ideal condition for the working out of such a scheme. Cooperative undertakings of this nature have been successfully maintained by other industries under less favorable conditions ²⁷.

There are several advantages accruing from a central reference library that cannot be derived from smaller ones privately owned and maintained, however good they may be. The most obvious of these is the greater completeness of the collection. This results from the larger funds and the more liberal housing facilities possessed by the central library as well as from the greater economy in the purchase of books and in administration possible to it. Several firms, each contributing an amount smaller than that needed for the maintenance of a library of its own, could secure to a central library a sum larger than that usually spent by any one firm on its own collection. With these larger funds the central organization could buy more economically than the small one. Orders could be consolidated and freight charges cut, while better second hand and special prices could be secured. In addition a large library always attracts to itself more free and gift material of value than the small one.

A central library would have a further advantage over the private collection in the matter of housing facilities. Any library established within the walls of a factory can afford to house only the best and by no means all of the material that would be valuable to the industry which it serves. A central organization would necessarily be located in a building or rooms of its own and could plan for future growth. The requirements of the collection would determine the size of the quarters occupied while otherwise the space available for library purposes would fix the size of the collection.

The central library owing to its nature and the larger funds which it would possess would be able to give service to its patrons far beyond what could be done by those privately maintained. A larger staff could be employed at

²⁷. The Portland Cement Association library serves about seventeen member companies scattered all over the country.

a smaller expense to each contributing firm. Through larger initial expenses, certain devices, such as the photostat or cameragraph, for instance, could be installed which would reduce the cost of further service to a marked degree. Such measures would be justified by the larger service given by the central library where they would not be so justified in the small private one.

A cooperative scheme of the nature outlined would make possible to the small firm, at a cost which it would find within its means, a library service which it could not otherwise secure. The large firm, on the other hand, demanding a more extensive and immediate service, would be able to reduce the library within its plant to a minimum working collection and to depend on the central institution for a great deal which it must now furnish for itself, at the same time receiving additional service which its own library could not under any circumstances give it.

Under the present system each firm must buy certain journals for a rather occasional use, as well as others which are used every day. If a central library existed it would be necessary to buy only the latter. If there were an excessive loan demand on any piece of literature belonging to the main collection, photograph copies, either made by the central institution or secured from other sources, could be put into circulation to fill the need. This photograph material would become a permanent possession of the central library, to be kept on file by it or to be sent to the different firms for such periods of time as it was needed by them.

The firm library would not only not find it necessary to buy certain material it now purchases, but it would be able to reduce its files of back periodicals. The business library does not ordinarily house any more journal files than is absolutely necessary, thereby often depriving itself of material it might later use, but in spite of this fact it finds it necessary to keep volumes which may contain material not often enough used to justify its preservation if it were elsewhere available. The same principle holds true whether these back periodicals are saved as bound volumes or are preserved as clippings or separate articles.

In addition to the reduction in the size of the collec-

tion the central library would decrease the amount of routine work done by the private ones. The latter could depend on the central organization for nearly all its indexing. A magazine digest or index printed or mimeographed could be issued to each member firm at stated intervals and be utilized by it as a permanent index. To serve this double purpose this might be issued in both sheet and card form from the outset. An index so acquired by the firm would cover not only its own working collection but also the larger collection belonging to the central library.

Certain firms having producing or selling agencies widely scattered in location have so organized their library systems that one centrally located agency, usually the general offices or the largest producing plant, does all the book buying, cataloging and preparing for the shelves for the whole system²⁸. This principle has a wide application in the administration of public library branches and university departmental libraries. There is no reason why such a policy might not be adopted by the library under discussion, thereby developing a true library system, having at its head an institution possessing a large well stocked storehouse of books, and using the best approved and most successful methods of administration and supplemented by small working collections within those factories which require more immediate service.

A library for the rubber industry such as is outlined above would make an endeavor to collect all the material available which might be useful to the industry and to preserve permanently all that might be expected, even remotely, to be of any future value. Its collection would cover all the various classes of literature needed by any department from the experimental laboratory to the branch office and foreign agent. Up to date methods of organization and administration would make it possible to furnish complete, accurate, and immediate service to its patrons. The firms supporting it would receive the advantages of the large reference library without sac-

28. The New Jersey Zinc Co., N. Y., has general offices in New York, mines at Franklin, New Jersey, and factories at Palmerton, Pennsylvania, and Depue, Illinois. The New York library does the buying for all the others. The General Electric Company buys all the books for its large system of factories and other agencies at the Schenectady, N. Y., library.

rificing those of the small and conveniently located office, factory or laboratory library.

APPENDIX I.

Thirty five scientific and technical journals on chemistry and physics useful to the rubber industry from which first purchases are recommended.

Analyst.
Annalen der Chemie.
Annalen der Physik.
Annales Chimiques Analytiques.
Annali di Chimica Applicata.
Archiv der Pharmazie.
Berichte der Deutschen Gesellschaft.
Berichte des St. Petersburger Polytechnischen Instituts des Kaisers Peter des Grossen.
Bulletin de Société Chimique de France.
Chemiker Zeitung.
Chemsch Weekblad.
Chemische Revue über die Fett-und Harz-Industrie.
Chimie et Industrie.
Comptes Rendus.
Journal de Chimie Physique.
Journal der Russischen Physikalisch-Chemischen Gesellschaft.
Journal of Industrial and Engineering Chemistry.
Journal of Physical Chemistry.
Journal of the American Chemical Society.
Journal of the Chemical Society, London.
Journal of the Society of Chemical Industry.
Kolloid Zeitschrift.
Kolloid Chemische Beihefte.
Kunststoffe.
Metallurgical and Chemical Engineering.
Pharmazeutische Zentralhalle.
Physical review.
Recueil des Travaux Chimiques.
Revue Général de Chimie Pure et Appliquée.
Zeitschrift für Angewandte Chemie.
Zeitschrift für Anorganische Chemie.
Zeitschrift für Chemie und Industrie der Kolloide.
(Succeeded by Kolloid Zeitschrift above.)
Zeitschrift für Physikalische Chemie.
Pharmazeutische Zeitung.

This list has been compiled from a study of five abstract journals; Chemical Abstracts, Chemisches Zentralblatt, Journal

of the Chemical Society of London, Jahresbericht über die Fortschritte der Chemie, (Liebig and Kopp), and Jahresbericht über die Leistungen der Chemischen Technologie, (Wagner).

APPENDIX II.

The following are among the more valuable of the government publications on the cultivation and preliminary treatment of rubber.

Federated Malay States. Bulletin of the Kuala Lumpur Experiment Station.

Covers agricultural and chemical articles. Abstracted in the Chemical Abstracts.

Great Britain. Board of Scientific Advice for India. Annual Report.

Covers the investigations carried on by the Board. Has some articles on analysis of latex.

Great Britain. Imperial Institute. Bulletin, (quarterly). Occasional articles on rubber cultivation and curing problems.

Burma. Department of Agriculture. Bulletin. Occasional numbers have articles on cultivation diseases and tapping of the Hevea tree.

Ceylon. Department of Agriculture. Bulletin. Frequent numbers have articles on vulcanization and agricultural methods.

Netherlands. Dept. of Agriculture, Trade and Industry. Mededeelingen over Rubber.

Abstracted in Chemical Abstracts.

Dutch East Indies. Verslag omtrent den Staat van het Algemeen Proefstation te Salitiga.

Occasional articles on rubber.

Dutch East Indies. Verslag omtrent de te Buitenzog Gevestigde. Technische Afdelingen (van het Dept. van Landbouw).

Contains reports of the work done by the Agricultural Chemisch Laboratorium and the Gouvernements Guttapercha Onderneming.

Dutch East Indies. Department of Agriculture. Jaarboek. Reports work done by the Agricultural Chemisch Laboratorium, the Gouvernements Guttapercha Onderneming te Tjipetin and the Gouvernements Caoutchouc Onderneming te Langsa.

Dutch Guiana. Department of Agriculture. Bulletin. Frequent numbers have articles on Hevea, tapping practices and diseases. The government has an experiment field at Domburg.

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